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Abstract

We analyse stock price behaviour around the disclosure of corporate insider transactions after the introduction of the Market Abuse Directive (MAD). Ranking according to our Insider Trading Enforcement (ITE) index highlights significant differences in the MAD enforcement between French and German legal origin countries. We document contrarian behaviour of insiders in all of the sample countries. Insiders reveal significant information to the public through both their purchases and sales. The price impact of the insiders' transactions is particularly strong in countries with a lower ITE index (i.e. weaker public enforcement).

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1. Introduction

While insider trading regulation has existed in the US since 1934 and in the UK since 1976, comparable regulatory requirements were only developed in continental Europe in the last twenty years. The European Community (EC), in its efforts to strengthen the integrity of the member states' financial markets and thereby enhance market efficiency, released the Insider Dealing and Money Laundering Directive (89/592/EEC) in 1989. The directive legally defined insiders and insider information and was transposed into national law during the 1990's by most of the member states. In 2003, the Market Abuse Directive (MAD) (2003/6/EC) replaced the old (1989) directive.[1] The overall objective was to introduce a European Union (EU) standard for insider dealing and market manipulation so as to promote market integrity and instill investor confidence in the financial markets.[2]

The importance of the enforcement of securities laws and regulations against financial markets misconduct has been documented in prior international studies (see Cumming et al. (2015) for an excellent synthesis of relevant studies). The evidence about the relative importance of private and public enforcement of securities laws for financial market development is, however, inconclusive (e.g., Djankov et al., 2008; Jackson and Roe, 2009). Since recent regulation was not introduced in response to a specific case of market abuse in any of the EU countries, but was mandated (exogenously) by the EU, it represents a unique natural experiment (Aitken et al., 2015). This experiment, therefore, allows us to examine the importance of public enforcement of the MAD on insider

[1] The directive 2003/6/EC is complemented by four other EU initiatives, namely the Commission Directives 2003/124/EC, 2003/125/EC and 2004/72/EC and the Commission Regulation 2273/2003. The non EU-member Switzerland implemented a similar regulation that closely follows the definitions of the EU regulation (see ESMA, 2012).

[2] A comprehensive analysis of the Market Abuse Directive is provided in Siems (2008).

dealing across European countries. Specifically, we analyse the information content of insider trading disclosures in seven continental European countries: Austria, Belgium, France, Germany, Italy, the Netherlands, and Switzerland. Our sample comprises 46,172 insider trading disclosures from 2,096 companies during the period 1st January 2006 to 31st December 2013. Thus, our sample period begins after the implementation of the MAD and, therefore, includes countries with the same regulation. Notably, all sample countries are governed by civil law with less emphasis on private litigation compared to common law countries (see Jackson and Roe, 2009). The sample countries are, however, split between German (Austria, Germany, and Switzerland) and French (France, Belgium, Italy, and Netherlands) legal origin with important differences.[3] Previous literature, for example, document differences between German and French legal origin countries in: (i) the development of financial intermediaries and markets (Beck et al., 2003); (ii) strategies for protecting minority shareholders and creditors (La Porta et al., 1998); (iii) regulation of security issuance through security laws (La Porta et al., 2006); (iv) and regulation of insider trading (Cumming et al., 2011). It is, however, not clear whether German or French legal systems generate better public enforcement in the area of insider dealing.

The differences in public enforcement of the MAD among our sample countries could lead to varying price effects following the disclosure of insider transactions. For example, weaker enforcement leads to investors' mistrust and less transparent markets. This in turn results in less reliable information available to investors. Accordingly, we

[3] We follow the La Porta et al. (1998) classification of legal origin.

predict more positive abnormal returns after purchases and more negative abnormal returns after sales in countries with weaker public enforcement of insider regulation.

Jackson and Roe (2009) and Fidrmuc et al. (2013) are works closest to ours, although our approach differs from prior work in two important ways. First, we develop an index for our sample countries that focuses specifically on public enforcement of the MAD in the context of insider trading. Our public enforcement Insider Trading Index (ITE) combines regulators' formal legal powers (sanctioning approach, penalties, and disclosure of decisions), resource-based measures of public enforcement (supervisory capacity), and evidence on actual enforcement activities (number of sanctions and discharges). The importance of information on the actual enforcement activities was highlighted in previous literature (e.g., Bhattacharya and Daouk, 2002; Jackson and Roe, 2009) but has not been examined due to lack of data. Bhattacharya and Daouk (2002), for example, suggest that for efficiency of insider trading regulation the key issue is not whether formal powers exist, but whether regulators actually exercise the powers by sanctioning offenders.

Second, Fidrmuc et al. (2013) use the Anti-self-dealing (ASD) index of Djankov et al. (2008) as a measure of legal protection of minority shareholders against expropriation by corporate insiders.[4] Although relevant to insider dealing, self-dealing (or "private

[4] Shleifer and Vishny (1997) list the following forms of self-dealing: executive perquisites, excessive compensation, transfer pricing, appropriation of corporate opportunities, self-serving financial transactions such as directed equity issuance or personal loans to insiders, and outright theft of corporate assets.

benefits of control") does not specifically include insider dealing.[5] Furthermore, the ASD index is a proxy for private rather than public enforcement and has been calculated based on legal rules prevailing in 2003, thus, long before the implementation of the MAD.

Our main findings are first that French legal origin countries (France, Italy, Belgium, and Netherlands) score significantly better in terms of the ITE index compared to their German (Austria, German, and Switzerland) origin counterparts. The results are robust compared to alternative proxies for ITE constituents. Second, insider purchase transactions tend to take place after decline in abnormal returns. The purchases create a significant positive price effect resulting in positive cumulative abnormal returns (CARs). This positive effect is more pronounced in countries with a lower ITE Index (weaker public enforcement). The effect of prior sales and firm size are negative and statistically significant in all sub-periods, whilst transaction volume is significant during and after the financial crisis only. Overall, we find evidence for the existence of typical contrarian strategies for insider purchases. Third, we report relevant pricing information for sale transactions, in contrast to corresponding findings for the US (Lakonishik and Lee, 2001). Insiders also tend to adopt contrarian strategies when they sell shares of their own companies. The enforcement of insider trading regulation plays an important role for sale transactions only during the crisis period, a period characterized by a much larger information asymmetry between insiders and outside investors.

[5] The ASD index focuses on the following question: "if a controlling shareholder wants to enrich himself while following the law, how difficult is it for minority shareholders to thwart such activity before it takes place and to recover damages if it does occur?" (Djankov et al., 2008, page 432).

The paper is structured as follows. We begin in Section 2 by a review of the relevant literature and motivation of our research hypotheses. In Section 3 we explore the enforcement of regulation on insider trading and develop our ITE public enforcement index. In Section 4 we describe our dataset and the sample selection procedure, and in Section 5 we present the chosen methodology. The empirical results are discussed in Section 6, followed by robustness checks in Section 7. Concluding remarks are set forth in Section 8.

2. Literature and hypotheses

2.1 Price effect of legal insider trading

A large majority of previous academic research in the field of legal insider trading has focused on the US. For example, research on legal corporate insider trading documents that US insiders (and to some extent outsiders mimicking insiders' behavior) are able to earn significant abnormal returns. These results are documented in the early studies (see, e.g., Jaffe, 1974; Finnerty, 1976; or Seyhun, 1986) and confirmed by more recent US studies (e.g., Lakonishok and Lee, 2001; Jeng et al., 2003; or Aktas et al., 2008). Abnormal returns earned by insiders are due to the contrarian investment style adopted by insiders as well as their exploitation of private information.[6] The above findings were echoed in studies of the UK market (see Pope et al., 1990; Gregory et al., 1997; Friederich et al., 2002; Fidrmuc et al., 2006). Fidrmuc et al. (2006), for example, reported significant abnormal returns following insider transactions in the UK. The

[6] Cziraki et al. (2016) report complementarities between information in event announcements (i.e. share repurchases and seasoned equity offerings) and pre-event insider trading. There is also evidence that the presence of short sellers (Massa et al., 2015) and CDS trading affects trading behavior and ability of insiders to extract rent on their private information (To et al., 2016).

reported returns were higher than in the US market due to faster reporting of trades in the UK.

Compared to the US and the UK, evidence for continental EU countries is less available and less conclusive. For example, whilst some studies report statistically significant price effects around announcement days in Austria (Fidrmuc et al., 2013) and Italy (Dardas and Guttler, 2011; Bajo and Petracci, 2006), others report no statistically significant abnormal returns in these countries.[7] Overall, the evidence for Germany (Klinge et al., 2005; Dymke and Walter, 2008; Aussenegg and Ranzi, 2008; Betzer and Theissen, 2009; Dardas and Guttler, 2011), Belgium (Fidrmuc et al., 2013) and Netherlands (Aktas et al., 2007; Dardas and Guttler, 2011; Fidrmuc et al., 2013; Cziraki et al., 2014; Biesta et al., 2003) is more conclusive in suggesting statistically significant abnormal returns around the announcement of insider trades. A rare study on Switzerland also suggests statistically significant price effects (Zingg et al., 2007). Del Brio et al. (2002) report that outsiders cannot benefit from mimicking disclosed insider trades in Spain. However, there are no previous EU studies covering the most recent period and examining specifically the information content of insider trades during and after the 2008-10 financial crisis. US evidence suggests that contrarian trades could be profitable during the financial crises (see Friedrich et al. 2002; Seyhun, 1990; Gangopadhyay et al., 2009). In line with the 'flight to quality' hypothesis, investors move towards blue chip stocks which depresses the price of smaller stocks. Corporate insiders may view this as a time to 'pick up bargains'. We therefore conjecture that insiders tend to adopt a contrarian strategy, especially during financial crises.

[7] See for example Dardas and Guttler (2011) for evidence on Austria and Fidrmuc et al. (2013) for evidence on Italy.

Asymmetric information theory implies that the uncertainty about the value of smaller companies is higher than that of larger, well-known firms. Larger firms are typically followed by more analysts and are more easily forced to disclose private information to the public. Previous evidence also suggests that larger firms tend to be priced more efficiently (Lakonishok and Lee, 2001). Thus, we expect larger abnormal price effects of insiders' transactions in smaller firms.

Gregory et al. (1997) suggest that, according to the microstructure theory, trading volume is a signal itself. Large trades are expected to have a larger impact than small trades. As the disclosure of legal insider trades takes place only several days after the trade, during this interval the information content of the trading volume will have caused a large (small) price adjustment for large (small) transactions. Therefore, the additional effect on security prices of the disclosure of a legal insider trade will be relatively more pronounced for larger trades than for smaller trades. Similarly, the extent of the reduction in information asymmetry due to the purchase or sale transactions of insiders should be positively associated with the number of insiders that are buying or selling on the same trading day. There is, for example, a difference between one insider buying (selling) and more insiders buying (selling) on a specific date. If more insiders buy (sell), this may convey more information than if only one insider trades. We also control for purchases (sales) during the period of 20 trading days prior to the date of disclosure. We conjecture a weaker price impact of purchase (sale) transactions that follow insiders' sale (purchase) transactions. Thus, the reversals in trades are expected to have lower information content.

2.2 Enforcement of security laws and legal insider trading

Previous literature suggests that insider trading laws fail to mitigate insider trading (Bris, 2005) and often do more harm than good when not properly enforced (see Beny, 2005 and 2007; Bhattacharya and Daouk, 2002 and 2009). The literature also documents the importance of the enforcement of insider trading laws for price informativeness. Fernandes and Ferreira (2009), for example, report that enforcement affects price informativeness differently depending on a country's infrastructure. The positive impact of the intensity of enforcement (measured by a country's first-time enforcement of insider trading laws) on the price informativeness tends to be concentrated in developing countries with more efficient judicial systems, investor protection, and financial reporting.

Fidrmuc et al. (2013) examine how shareholder protection impacts the price effect of the disclosure of insider trading. They analyse sixteen countries, over the period from 2002 to 2007. Authors utilise the anti-self-dealing (ASD) index of Djankov et al. (2008) and provide evidence for the information-content hypothesis: shareholder protection enhances the transparency and trustworthiness of insider trades and, therefore, increases the (positive) market reaction to insider purchases. For sales, shareholder protection decreases their (negative) information content. Authors also report that their results are robust to heterogeneity in MAD enforcement in their subsample of EU countries.

Cziraki et al. (2014) examine insider trading from a point of view of private benefits of control and potential rent extraction. For example, the absence of anti-shareholder devices (i.e. less private benefits of control) leads to greater shareholder awareness

which might curb insider trading and result in lower profits (the monitoring hypothesis). The private benefits of control however tend to be larger compared to potential profits generated by insider trading. When insiders cannot exploit private benefits, they are motivated to engage in insider trading (the substitution hypothesis). The authors report that insider trades are more profitable at Dutch firms where shareholder rights are not restricted by anti-shareholder mechanisms, which is in line with the substitution hypothesis.

Christensen et al. (2011) document that market liquidity in EU countries increases with stricter implementation and enforcement of the European directives, stricter securities regulations, and a better track record of implementing regulation and government policies.[8] More recently, Cumming et al. (2016) report significant differences in the intensity of enforcement of the MAD across European countries. There is, however, a paucity of literature on MAD enforcement for price informativeness. We add to the literature by examining the differences in public (rather than private) enforcement of the most recent regulation (MAD) and the effect of the enforcement level on the price impact of the disclosure of insiders' transactions. We conjecture a negative association between the public enforcement and the price impact of the disclosure of insider trades. A stronger public enforcement improves standards and leads to better transparency and better quantity and quality (i.e. precision) of information available to investors. Insider trades in countries with a stricter public enforcement should, therefore, result in a smaller price impact compared to the price impact in countries with a weaker enforcement. The above prediction is consistent with disclosure models (Verrecchia, 2001) and enforcement theory (Djankov et al., 2003). The prediction is also in line with

[8] For evidence on securities laws and misconduct in primary (i.e. IPO) markets, see Bonaventura et al. (2016).

the application of the enforcement theory to securities regulation (Shleifer, 2005; Bhattarcharya and Daouk, 2009; Cumming et al., 2011).

3. Insider trading regulation and public enforcement (ITE) index

The MAD requires each member state to establish a single regulatory and supervisory authority to address insider dealing and market manipulation. Importantly, the new directive requires corporate insiders to immediately (i.e. within 5 trading days) disclose their trades. Under Article 18 of the MAD, EU member states had to implement local regulations that require the disclosure of corporate insider trading by October, 12th 2004. With the exception of Germany, implementation took longer and was completed only in 2005. For example, Cumming and Johan (2008) indicate that EU exchanges did not adopt/implement the provisions in the MAD in a meaningful way during 2004-2005. In December 2004 the Transparency Directive (TD) was approved (2004/109/EC), followed by the implementation of the directive in March 2007 (2007/14/EC). TD focuses on greater transparency and enforcement of the existing disclosure requirements.

We use the following criteria when calculating our insider trading enforcement (ITE) index: (i) The enforcement record: 1 if above (or equal to) the median ratio of the number of natural or legal persons sanctioned or discharged for insider dealing (2008-10) and the stock market trading volume during the same period;[9] (ii) Sanctioning

[9] The average stock market trading volume (in billion US$) for all countries, except Switzerland, is from Cumming et al. (2016). The average stock market trading volume (2007-09; in billion US$) for Switzerland is from the SIX Swiss Exchange (Annual Statistics-various issues, available from: www.six-

approach: 1 if both sanctioning approaches were followed, 0 if either an administrative or criminal sanctions approach was followed;[10] (iii) Disclosure of sanctioning decisions: 1 if disclosed, 0 otherwise; (iv) Maximum penalty for MAD related insider trading abuses: 1 if above (or equal to) the median penalty in the sample countries, 0 otherwise; (v) Maximum penalty for TD insider trading related abuses: 1 if above (or equal to) the median penalty in the sample countries, 0 otherwise;[11] (vi) Supervisory capacity: 1 if the average number of staff employed in the national banking and insurance regulating institutions normalised by a country's stock market trading volume is above (or equal to) the median, and 0 otherwise.[12] The ITE Index is created by summing up the above six indicators thus generating a scale of 0 to 6. Table 1 provides a summary of information related to the enforcement of the MAD and TD directives in our sample countries. Austria, Switzerland and Germany rank low on sanctioning (columns 6, 7 and 8). Switzerland is also ranked at the bottom by supervisory capacity (column 9) whilst Germany and Austria perform well on this component. By legal origin, French civil law countries perform marginally worse on supervisory capacity but better on penalties and number of sanctions.

*** Insert Table 1 about here ***

swiss-exchange.com). The number of natural and legal persons sanctioned or discharged for insider dealing during 2008-10, is from ESMA (2012; Tables F.3.2 A and B).

[10] Information about the sanctioning approach, publication of decisions, and penalties for all countries, except for Switzerland, is taken from ESMA (2012; Tables D.1., F.6.2., G.1., and Annex A.7). The sanctioning approach and penalties for Switzerland are from Kern (2013).

[11] Maximum penalties related to disclosure of insider trades under TD are from Christensen et al. (2011).

[12] The average number of staff employed in the national banking and insurance regulating institutions (2008-10) for all countries, except Switzerland, is from Horakova and Jordan (2013), as cited in Cumming et al. (2016). The average number of staff employed in the national banking and insurance regulating institutions (2009) for Switzerland is from FINMA (2009).

The ITE index for our sample countries is presented in Table 2 (column 10). The sample country with the highest ITE index is Italy (6) followed by France (5), Belgium (4), the Netherlands (2), Austria and Germany (1), and Switzerland (0). Overall, French legal origin countries score better compared to German origin countries. The difference between average (mean) rankings is statistically significant at the 5% level.

Our ITE index is based on very specific measures related to the public enforcement of the MAD. It is plausible that, for example, some countries fare highly by other indices but poorly by the ITE index. We therefore present rankings of our sample countries by relevant indices used in previous literature. For example, we present rankings of our sample countries by the regulator resource based measures of public enforcement (Jackson and Roe, 2009), the anti-self-dealing index (ASD) (Djankov et al., 2008), two public enforcement (PE) indices (La Porta et al., 2006; Djankov et al., 2008), the insider trading rules index (Cumming et al., 2011), the legal enforcement index (La Porta et al., 1998), and the disclosure index (La Porta et al., 1998).

*** Insert Table 2 about here ***

The results for regulatory based measures (RStaff and RBudget) of public enforcement are reported in columns 2 and 3, respectively.[13] Overall, French legal origin countries score higher compared to their German legal origin counterparts which is in line with the reported ITE rankings. The difference of resource based measures between French and German legal origin countries is, however, not statistically significant. Notably, we

[13] RStaff is a number of regulatory staff per million population. RBudget is regulatory budget per billion of GDP ($). Both are defined for an extended sample and observations in Jackson and Roe (2009).

report for our sample a statistically significant difference between German and French legal origin countries regarding the enforcement of insider trading rules (Table 1). Our measure is, however, based on different sources and with different adjustments. For example, our adjustment is based on the size of stock markets rather than GDP as used in prior literature (e.g. Jackson and Roe, 2009). The size of stock markets could be better suited given that we examine the importance of public enforcement for insider dealing rather than its importance for the development of financial markets. It is also worth noting that staffing and budgets are both inputs rather than outputs of the enforcement activities (Jackson and Roe, 2009) and, thus, should be supplemented with some output measures.

The results for the ASD index are reported in column (4) of Table 2. The differences in the mean ASD between our sample of German and French law countries are not statistically significant and they are, thus, consistent with the results reported in Djankov et al. (2008).[14] The ranking of our sample countries by the public enforcement index of Djankov et al. (2008) is reported in column 5 (PE-DLLS). Overall, the difference between German and French legal origin countries is statistically significant. Contrary to the ranking by ITE, German legal origin countries outperform countries with French legal origin. Switzerland, for example, features highly (2nd place) according to PE-DLLS but performs worst in terms of ITE among our sample countries. The poor ranking of Switzerland by ITE index should not come as a surprise given the extremely poor track record of Switzerland in the area of insider dealing (see e.g., FATF, 2005). The poor track record of Switzerland is at odds with an extremely developed banking

[14] Djankov et al. (2008) report a lack of statistically significant difference between the mean ASD index of German and French legal origin countries in their international sample of 72 countries.

sector and stock market. During the 1990s, Swiss authorities brought only a few prosecutions to court and obtained only 14 convictions (Kern, 2013).[15] The ranking by the public enforcement index of La Porta et al. (2006) (PE-LLS in column 6) is very much in line with the ranking according to our ITE index.[16]

Column (7) reports the Insider Trading Index of Cumming et al. (2011). The corresponding values of this index are from November 2007 to October 2008 (and January 2006 to October 2007). Cumming et al. (2011) report a significantly higher Insider Trading Index for their sub-sample of nine German legal origin countries (worldwide) compared to the sub-sample of fifteen French legal origin countries (worldwide). The difference between the mean values is statistically significant at the 1% level. The study however does not cover Belgium and the Netherlands, which are included in our sample of countries of French legal origin. This prevents us from making a direct comparison to their results by legal origin.[17]

Columns (8) and (9) report the La Porta et al. (1998) measures of legal enforcement (LE) and disclosure index. The legal enforcement index for German origin countries in our sample is higher compared to the French legal origin countries. It is however opposite for the disclosure index. We find no statistically significant difference in the mean values of the legal and disclosure indices between French and German legal origin countries.

[15] Furthermore, in 2009 the SIX Swiss Exchange, headquartered in London and governed by UK law, moved its trading venue to Zurich and the exchange entity reincorporated as a Swiss legal entity, thereby avoiding the stricter requirements of UK law (Kern, 2013).
[16] With an exception of Belgium which comes last according to La Porta et al. (2006).
[17] Based on the limited data, the difference between French and German legal origin countries is not statistically significant.

Overall, the results in Table 2 suggest that French legal origin countries score better by six out of nine indices. The differences between French and German legal origin countries are statistically significant only for PE-DLLS and ITE. We also present correlations between our ITE index with alternative measures in Table 3. ITE is highly negatively correlated with PE-DLLS and highly positively with PE-LLS and ASD. Our ITE public enforcement index is therefore more in line PE-LLS than with PE-DLLS. The results are also in line with Jackson and Roe (2009) who reported a negative correlation between PE-DLLS and PE-LLS in their international sample of developed and developing countries. The negative association of some of the cross-country public enforcement indices based on regulators' formal powers (e.g. PE-LLS) and/or regulators formal qualities (e.g. PE-LLS) is often due to an ambiguous (i.e. open to interpretation) and weighing of index constituents.[18]

*** Insert Table 3 about here ***

4. Sample selection and descriptive statistics

4.1 Sample selection process

Data for insider transactions is collected from the Directors Deals (DD) database.[19] The Directors Deals database applies the same classification of insiders across countries by including the following: full time executive directors and board members; former executives and former board members, members of supervisory boards; person

[18] Jackson and Roe (2009) provide an example of independent regulators that are integrated in a consolidated financial supervisor. Although theoretical literature is divided on the relative merits of independent and integrated regulators, PE-LLS index clearly favours independent regulators.
[19] More information on this database is available at: http://www.directorsdeals.com.

dispensing managerial responsibilities; non-executive directors (members of boards and/or in advisory capacity on part time basis). We start with all 93,804 director deals available for companies from our sample countries during the period 1st January 2006 to 31st December 2013. For Austria and Switzerland, DD reports director dealings transactions only from January 2008 and March 2007 onwards respectively. For these two countries we update the sample using data available at the national regulator director dealings websites (i.e. for Austria from January 2006 to December 2007 and for Switzerland from January 2006 to February 2007). This yields a total initial sample of 95,402 director dealing transactions, i.e. all transactions from January 2006 until December 2013 (see Table 4).

*** Insert Table 4 about here***

From this total sample we exclude deals on securities other than ordinary (common) and preferred shares. We also exclude transfers, exercise and dividend related transactions, and keep only pure purchase and pure sale transactions. Furthermore, to ensure the integrity of the dataset we remove announcements that contain obvious errors, like having the day of the disclosure before the day of trading, as well as transactions where the announcement took place more than one month after the transaction. We also aggregate all purchase and sale deals in the same security disclosed on the same day. Such trading patterns might be due to the partial execution of orders and do not convey additional information. If the purchase and sale transactions occur on the same day and the aggregated net value is zero (i.e., an equal number of shares were bought and sold on the same trading day), we exclude these transactions. Net zero transactions occur

seldom and this is typically the case when one director is selling shares to other directors.

The above procedure results in 46,172 pure net deals in ordinary, preferred, and common shares, 29,514 (net) purchases and 16,658 (net) sales. The overall number of purchases is higher than the number of sales. This is also the case in all sample countries except in Switzerland with slightly more sales than purchases. The number of companies underlying the final number of director trading transactions is 2,096 for the total sample of 46,172 transactions. Thus, on average about 22 transactions are reported per company during our 8-year sample period. The highest percentage of purchases relative to sales during the sample period is recorded in Austria at 78%. Interestingly, the lowest percentage is revealed in Switzerland at 49% of purchase transactions.

Figure 1 shows the development of disclosed insider trades for our total sample of seven countries. From Figure 1 we can clearly see that the number of purchases peaks during the recent financial crisis (i.e. in 2008). Before the crisis (2006-2007), the number of sales is in fact (often) higher than the number of purchases. From this we identify three distinct sub-periods: before the financial crisis (2006-07), during the financial crisis (2008-10), and after the financial crisis (2011-13).

*** Insert Figure 1 about here ***

4.2 Descriptive statistics

There are 12,623 deals in the first (pre-crisis) sub-period, 18,629 deals during the crisis period, and 14,920 deals during the post-crisis period (see Table 4). The average number of declared purchase transactions per company is 14 and for sale transactions 8 (reported for the total period). The percentage of purchases increased sharply in all sample countries during the crisis period. Notably, the two countries with the highest percentage of purchases during the crisis are Austria (83%) and Germany (82%). For the total sample, the percentage of purchases jumped in the crisis period to 74% (from 52% before the crisis). After the crisis, the percentage of purchases dropped to 62%, which is still higher compared to the pre-crisis period. A further comparison of the sample countries shows that during the pre-crisis period there are more sales than purchases in France, Belgium, Switzerland, and the Netherlands. During the crisis period there are more purchases than sales in all sample countries. The same trend continues during the post-crisis period in all countries.

The mean volume per purchase transaction is €843,963 (median is €39,053) and the mean volume per sale transaction is €2,404,320 (median is €128,071) (see Table 5). In line with the evidence reported in the literature (Fidrmuc et al. 2013; Fidrmuc et al., 2006), purchase transactions are on average smaller than sale transactions. The overall volume of all sample transactions is about €65 billion.

*** Insert Table 5 about here ***

5. Methodology

The empirical approach of our paper is different from Jaffe (1974), Rozeff and Zaman (1988), Lakonishok and Lee (2001) in that we examine a rapid price reaction around the announcement day of insider transactions instead of CARs over a 6-12 month period following disclosure. The rapid price reaction implicitly assumes some degree of market efficiency and has been used in related studies (see Friedrich et al., 2002; Fidrmuc et al., 2013). We therefore use an event-study approach to analyse the short-run effects of legal insider trading disclosures. Our research design follows the common approach delineated in MacKinlay (1997) and in Campbell et al. (1997).

The event we focus on is the disclosure of legal corporate insider transactions. We analyse the evolution of the stock price before the insider trading disclosure by looking at a period of twenty trading days prior to disclosure date. This analysis may provide valuable insights into the timing capabilities of corporate insiders. To investigate market reactions to the disclosure of legal insider trades we analyse the two, five, ten and twenty trading days following the disclosure date.

The Market model residuals are used as abnormal returns. The model parameters are estimated using an estimation window of 100 trading days before the event window. To calculate market adjusted returns the following indices are used to proxy for country-specific market returns: (1) Austria: ATX, (2) Belgium: BEL20, (3) France: CAC All Traded index, (4) Germany: CDAX, (5) Italy: FTSE-MIB index, (6) the Netherlands: AEX All share index, and (7) Switzerland: SMI.

Overall, our procedure for measuring the price impact is a standard approach and thus makes our results better comparable to other insider trading event studies. We perform four types of statistical tests to examine the significance of cumulative abnormal returns: (i) Cross-section t-test (see Brown and Warner, 1980), (ii) Standardised Cross-section t-test (see Boehmer et al., 1991), (iii) Corrado Rank test (see Corrado, 1989), and (iv) Generalised Sign test (see Cowan, 1992).

6. Results and discussion

6.1 Abnormal returns around the disclosure date

Figure 2 presents the development of mean cumulative abnormal returns (CARs) during the event window of 41 trading days (i.e. from trading day -20 to trading day +20 around the event (disclosure) day (i.e. day zero)). Our results suggest that insiders tend to purchase stock of their companies after periods of negative abnormal returns, and they tend to sell stocks after periods of positive abnormal returns.

*** Insert Figure 2 about here ***

This pattern is consistent across our three sub-periods, i.e., before, during, and after the financial crisis (see Figure 3).

*** Insert Figure 3 about here ***

For the twenty trading days before the disclosure of insider purchases, we observe a significant average CAR of -1.77% (see Table 6). The cumulative abnormal return is negative for a significant portion of around 58% of all purchase transactions. After the disclosure of insider purchase transactions we document a positive and highly statistically significant mean CAR (0 to 20) of +1.55 % for the period from the disclosure day to day + 20. This positive abnormal performance is even more pronounced during the crisis period with a CAR (0 to 20) of 2.31%. Our results are therefore in line with our hypotheses: (i) Insider purchases create a significant (positive) price impact; (ii) when purchasing stocks of their own company, insiders act as contrarian investors; and (iii) the price impact seems to be particularly strong during the financial crisis.

*** Insert Table 6 about here ***

Corporate insiders in Europe execute sale transactions after periods of high abnormal returns. We observe an average CAR of +1.53% (significant at the 1% level) for the twenty trading days before the disclosure date (see Table 7). This pattern is most pronounced in the crisis period with a CAR (-20 to -1) of +1.96%.

*** Insert Table 7 about here ***

We document statistically significant negative CARs after the disclosure date (e.g. -1.98% for the period from the disclosure day to day +20). The differences across sub-periods are less pronounced compared to the evidence reported for purchases, with

CARs (0 to 20) varying between about -1.8 and -2.1%. The mean CARs are negative and statistically significant in all sub-periods. Absolute CAR (0 to 20) values for sales are higher than for purchases in both pre and post-crisis periods. The absolute value for CARs following purchases is higher than corresponding CARs for sales only during the crisis period. The stronger effect of sales measured by absolute values of CAR is surprising and contradicts findings from previous (US and UK) literature that the effect of sales tends to be softened since they are often lead by liquidity and diversification reasons (Lakonishok and Lee, 2001; Firdmuc et al., 2006).

6.2 Multivariate analysis

To further investigate possible determinants of abnormal performance after insider trading disclosures, we perform a multivariate cross-sectional analysis with $CAR_{0,20}$ (cumulative abnormal return from the date of disclosure until trading day 20 after the disclosure date) as the dependent variable. The regression model is:

$$\begin{aligned} CAR_{0,20,i} = \alpha_i + \beta_1 \cdot Sub2_i + \beta_2 \cdot PP_{-20,-1,i} + \beta_3 \cdot PS_{-20,-1,i} + \beta_4 \cdot Insider_i + \\ \beta_5 \cdot Volume_i + \beta_6 \cdot Risk_i + \beta_7 \cdot Size_i + \beta_8 \cdot BM_i + \beta_9 \cdot ITE_i + \varepsilon_i \end{aligned} \quad (1)$$

Sub2 is a dummy variable coded one for observations during the financial crisis period (2008-10), and zero otherwise. Further independent variables are the number of insider trades on the same day *(Insider)*, the transaction volume expressed as a percentage of the market capitalization on the day of disclosure *(Volume)*, the logarithm of the market capitalization on the day of disclosure *(Size)*, the book-to-market ratio to control for

valuation effects *(BM)*, and our insider trading enforcement index (*ITE*).[20] A higher financial risk may also contribute to a higher degree of information asymmetry. We therefore control for financial risk *(Risk)*, proxied by Debt (D) to Total Asset (TA) ratio (D/TA). We also control for previous purchases *(PP)* and previous sales *(PS)* during the 20 trading day period before the disclosure. *Size* and *BM* variables are frequently used in the literature to control for contrarian strategies (see Piotorski and Roulstone, 2005). We estimate this model (equation 1) separately for purchases and sales. The above estimations are repeated for different sub-periods after excluding *Sub2*, the dummy variable for the crisis period.

Table 8 presents the results for insider purchase transactions for the total period (2006-2013) and the three sub-periods. In the regression for the total sample (see Panel A) the coefficient for *Sub2* is positive and highly statistically significant. Consistent with our conjecture and our univariate results, the crisis period is associated with a significantly larger positive abnormal performance in the first 21 trading days after the disclosure of insider purchase transactions.

The coefficients for *PS* and *Size* are, as expected, negative and highly statistically significant in the regressions for all periods and all sub-periods (see Panels A, B, C, and D). The coefficients for *BM* are, as expected, positive but only statistically significant in the crisis period (see Panel C). The coefficient for *Risk* is positive and statistically significant only in the pre-crisis period. During the crisis period, larger purchases are positively, and significantly, associated with returns (see variable *Volume* in Panel C).

[20] Data on stock prices and company characteristics (Total assets, total liabilities, total shareholder equity, and market capitalization) were provided by Thomson Reuters Eikon and Datastream.

Importantly, the coefficients for *ITE* are negative and highly statistically significant in regressions for the total sample and in all three sub-periods (see Table 8, Panels A, B, C, and D). These results lend strong support for our hypothesis regarding the importance of the enforcement of insider trading regulation on the price impact of disclosure. Countries with a higher public enforcement exhibit a smaller price impact compared to countries with a weaker public enforcement.

*** Insert Table 8 about here ***

We estimate the economic significance of our results by examining how a 1-standard deviation change in an explanatory variable (e.g. *ITE*) (σ_{factor}) affects $CAR_{0,20}$ ($Coefficient_{factor}*\sigma_{factor}$). The overall effect of public enforcement on disclosure of purchases is negative with the strongest economic impact of *ITE* during the first and third sub-period. The results suggest that public enforcement has the most pronounced economic effect before and after the financial crisis and less during the financial crisis. For example, a 1-standard-deviation increase in *ITE* leads to a 76.5 basis points (bp) (=-0.3179*2.4072) reduction in cumulative abnormal returns associated with purchases during the first sub-period and a reduction of 82.9 bp (=-0.3567*2.3248) in the third sub-period. During the financial crisis the economic effect of *ITE* on $CAR_{0,20}$ is much lower (reduction of 36.2 bp (= -0.1580*2.2912) in $CAR_{0,20}$).

The results of the multivariate analysis for insider sales are presented in Table 9. Overall and in the pre and post-crisis periods, the coefficients for *ITE* are negative but not statistically significant. Therefore the public enforcement tends to be less important

for insider sales. This is in line with findings that insider sales generally have lower information content since they are often motivated by liquidity and diversification needs (see Fidrmuc et al., 2013). The **c**coefficient for the *ITE* index is positive and statistically significant only during the crisis period (see Table 9, Panel C). Thus, a better public enforcement of the MAD leads to a lower price impact (i.e. less negative abnormal returns) only in crisis periods (i.e., when information asymmetry between insiders and outside investors tend to be larger). Regarding economic significance, a 1-standard deviation change in the ITE index leads to a 47.2 bp increase in CARs (i.e. a less negative 21 day CAR after sales announcement) during the second sub-period.

*** Insert Table 9 about here ***

Coefficients for other variables *(PP, BM)* have expected signs in line with our predictions. *Volume* is again not statistically significant, while the size of the firm *(Size)* plays, as expected, an important role in regressions for the total sample and during the post-crisis period.[21]

7. Additional robustness checks[22]

We conduct additional robustness checks for our ITE index by examining ranking changes if a particular component is added or dropped from the index. For example, we use Jackson and Roe's (2009) resource based measures (RStaff and RBudget) instead of

[21] *Volume* and *BM* exhibit low tolerance levels (i.e. high correlation) in Panels A and D. We repeated estimates for the model without *Volume*. The signs and significance levels of all coefficients remain the same thus suggesting that the multicollinearity does not affect our results. Unreported estimates are available from authors upon request.

[22] Unreported results in this section are available from authors upon request.

our measure of supervisory capacity. Unreported results remain in line with the results highlighted in Table 2. Importantly, all French legal origin countries rank above their German counterparts. Similarly results with PE-LLS, instead of the sanctioning approach (ESMA, 2012), produce very similar results.

We also re-calculated the ITE index by adding RBudget, PE-LLS, and ASD index, for example, and excluding some of the measures (e.g., supervisory capacity, sanctioning approach). Overall, the ITE index is robust to use of different regulatory proxies and indices. Inclusion (or exclusion) of these indices does not materially affect our conclusions regarding the differences among our sample countries and the importance of public enforcement.

8. Conclusion

We examine the importance of public enforcement of the MAD on the price reaction following disclosure of insider trading. Our sample consists of seven civil law countries of French and German legal origin. The examination of the public enforcement of the market abuse regulation in EU is timely. It contributes to the debate about the recent replacement of the MAD with the EU Market Abuse Regulation (MAR) (592/2014) and the introduction of the Criminal Sanctions for the Market Abuse Directive (CSMAD) (2014/57/EU).

Our main findings are that French legal origin countries (France, Italy, Belgium, and Netherlands) score significantly better in terms of the ITE public enforcement index

compared to their German (Austria, German, and Switzerland) origin counterparts. The ranking by the ITE index still holds when using alternative regulatory and enforcements constituents. Second, insider purchase transactions take place after decline in abnormal returns and are followed by price increases. This positive price effect of disclosure of purchase transactions is more pronounced in countries with a weaker public enforcement of the MAD. Sale transactions also contain relevant price information, which is in contrast to findings in the US (see Lakonishok and Lee, 2001). Similar to purchases, insiders also adopt contrarian strategies when selling shares. For sale transactions, the ITE index is significantly related to cumulative abnormal returns only during the period of financial crisis.

Evidence regarding the relative importance of private and public enforcement of securities laws for financial market development is inconclusive. While La Porta et al. (2006) and Djankov et al. (2008) point towards private enforcement, Jackson and Roe (2009) conclude otherwise. Our results highlight the importance of the public enforcement of regulation on insider trading. The policy implication of our results is in line with Jackson and Roe (2009) who argue that the recent shift by the World Bank towards private, rather than public, enforcement of securities laws might be premature and not entirely evidence based.

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Table 1: Public enforcement of insider trading rules

This table presents regulatory authorities responsible for insider trading, entry-into-force dates for the MAD and TD, various aspects of sanctioning insider dealings, and supervisory capacity in sample countries. Classification by legal origin is from La Porta et al. (1998). Either (sanctioning approach) means either administrative actions or criminal sanctions approach. Both (sanctioning approach) means both administrative and criminal sanctions approach. Sanctioning approach, publication of decisions and penalties for insider dealing (under MAD) for all countries, except for Switzerland, are from ESMA (2012; Tables D.1., F.6.2., G.1., and Annex A.7). The sanctioning approach and penalties for Switzerland are from Kern (2013). The number of natural and legal persons sanctioned or discharged for insider dealing during 2008-10, is from ESMA (2012; Tables F.3.2 A and B). MAD (TD) entry-intro-force dates and penalties related to insider trading (MAD and TD) are from Christensen et al. (2011). Supervisory capacity is calculated by the authors as the average number of staff divided by the average stock market trading volume (2008-10). The average stock market trading volume (in billion US$) for all countries, except Switzerland, is from Cumming et al. (2016). The average number of staff employed in the national banking and insurance regulating institutions (2008-10) for all countries, except Switzerland, is from Horakova and Jordan (2013), as cited in Cumming et al. (2016). The average stock market trading volume (2007-09; in billion US$) for Switzerland is from SIX Swiss Exchange (Annual Statistics, available from: www.six-swiss-exchange.com). The average number of staff employed in the national banking and insurance regulating institutions (2009) for Switzerland is from FINMA (2009). Sample country scores with respect to sanctions and supervisory capacity are reported in [parentheses] in columns 6, 7, 8 and 9. P-values for T-test for differences in means and Wilcoxon matched-pairs signed-rank test for difference in medians. In column 6, maximum values used for calculation of means and medians.

Country	Responsible authority	MAD (TD) Entry-Into-Force Dates	Sanctions for insider dealing (MAD)			Sanction related to TD	Number of sanctions or discharges (MAD)	Supervisory capacity
			Sanctioning approach	Publication of decisions	Minimum/Maximum penalties (€)	Max penalties (€000)		
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
German legal origin								
Austria	Financial market authority (FMA)	Jan-05 (Apr- 07)	Either	No	No penalties [5]	30 [6]	0 [6]	0.06173 [1]
Germany	Federal financial services supervisory authority (BaFin)	Oct-04 (Jan-07)	Either	No	(1-999)/ (100,000-999,999) [4]	200 [4]	2 [5]	0.01689 [3]
Switzerland	Swiss Financial Market Authority (FINMA); since	Jan-08 (Jun-07)	Either	No	No penalties [5]	0 [7]	n.a.	0.00002 [7]
French legal origin								
Belgium	Commission for banking and insurance (CFBA)	Sep-05 (Sep-08)	Both	Yes	(1,000-9,999)/ pending on profit obtained [3]	2,500 [2]	22 [3]	0.01661 [4]
France	Autorité des Marchés Financier (AMF)	Jul-05 (Dec-07)	Both	Yes	No min./5 mil. or more [1]	10,000 [1]	158 [1]	0.00873 [6]
Italy	Commissione Nazionale per la Società e la Borsa (Consob)	May-05 (Apr-09)	Both	Yes	100,000/5 mil. or more [1]	620 [3]	38 [2]	0.04444 [2]
Netherlands	Authority for the financial markets (AFM)	Oct-05 (Jan-09)	Either	Yes	No min./1 mil. – 4,999,999 [2]	120 [5]	3 [4]	0.01218 [5]
Mean (median) for German legal origin					4.67 (5)	76.70 (30)	1 (1)	0.02621(0.01689)
Mean (median) for French legal origin					1.75 (1.5)	3,310 (1,560)	55.25 (30)	0.02049(0.01440)
German versus French; P-values for differences in means and medians					0.000 (0.102)	0.067 (0.109)	0.042 (0.180)	0.067 (0.593)

Table 2: Insider trading public enforcement Index (ITE)

This table presents values for the ITE index and comparison with other indices by legal origin. The ranking for sample countries by different indices is reported in [parentheses]. RStaff is a number of regulatory staff per million population (extended sample and observations) as defined in Jackson and Roe (2009) (Column 2). RBudget is regulatory budget per billion of GDP ($) (extended sample and observations) as defined in Jackson and Roe (2009) (Column 3). The Anti-self-dealing (ASD) index (available at http://post.economics.harvard.edu/faculty/shleifer/data.html) measures private enforcement, as defined in Djankov et al. (2008) (Column 4). PE-DLLS (available at http://post.economics.harvard.edu/faculty/shleifer/data.html) is a public enforcement index based on whether or not certain suspect corporate transactions can lead to a fine or jail sentences for the approving body, or fine or jail sentence for the principal wrongdoer as defined in Djankov et al. (2008) (Column 5). PE-LLS is a public enforcement index, calculated as arithmetic average of: (i) supervisor characteristics index; (ii) its rule-making power index; (iii) its investigative powers index; (iv) orders authority index; and (v) criminal authority index, as defined in La Porta et al. (2006) (Column 6). Column (7) reports the Insider Trading Index of Cumming et al. (2011). The corresponding values of this index are for the period over November 2007 to October 2008. Columns (8) and (9) report La Porta et al. (1998) measures of legal enforcement (LE) and Disclosure index. LE is an average of 3 legal variables. Disclosure index measures the inclusion or omission of 90 items in annual reports. Our Insider Trading Enforcement (ITE) index is calculated based on data from Table 1 (as described in Section 3) (Column 10). Reported probabilities are for a two samples T and Wilcoxon matched-pairs signed-rank test for difference in means and medians, respectively.

Studies	Jackson and Roe (2009)		Djankov et al. (2008)		LLS (2006)	Cumming et al. (2011)	LLS (1998)		This study
Index	RStaff	RBudget	ASD	PE-DLLS	PE-LLS	Insider trading rules	LE	Disclosure	ITE
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
German legal origin									
Austria	9.97 [3]	34,464 [3]	0.21 [6]	1.00 [1]	0.17 [6]	2 [2]	9.4 [2]	54 [6]	1 [5]
Germany	4.43 [7]	12,903 [7]	0.28 [4]	1.00 [1]	0.22 [5]	3 [1]	9.1 [3]	62 [4]	1 [5]
Switzerland	8.87 [4]	29,340 [4]	0.27 [5]	0.75 [2]	0.33 [4]	3 [1]	10 [1]	68 [2]	0 [6]
French legal origin									
Belgium	13.76 [2]	27,276 [6]	0.54 [1]	0.50 [3]	0.15 [7]	n.a.	9.4 [2]	61 [5]	4 [3]
France	5.91 [6]	28,851 [5]	0.38 [3]	0.50 [3]	0.77 [1]	2 [2]	8.7 [4]	69 [1]	5 [2]
Italy	7.25 [5]	61,239 [2]	0.42 [2]	0.00 [4]	0.48 [2]	3 [1]	7.1 [5]	62 [4]	6 [1]
Netherlands	23.53 [1]	131,285 [1]	0.20 [7]	0.00 [4]	0.47 [3]	n.a.	10 [1]	64 [3]	2 [4]
German versus French legal origin									
German origin; Mean (median)	7.76 (8.87)	25,569 (29,340)	0.25 (0.27)	0.92 (1.00)	0.24 (0.22)	2.67 (3.00)	9.50 (9.40)	61.33 (62)	0.67 (1)
French origin; Mean (median)	8.97 (7.25)	39,122 (28,851)	0.39 (0.42)	0.33 (0.50)	0.47 (0.48)	2.50 (2.50)	8.80 (8.70)	64.00 (62)	4.25 (5)
P-values for differences in means (medians)	0.373 (0.593)	0.267 (0.285)	0.183 (0.109)	0.015 (0.103)	0.202 (0.285)	0.789 (0.317)	0.407 (0.166)	0.534 (0.276)	0.019 (0.109)

Table 3: Correlation matrix

This table presents the correlations among our insider trading public enforcement index (ITE), public enforcement indices (PE-DLLS, PE-LLS), legal index (LE), regulatory resource measures of public enforcement (RStaff, RBudget, Supervisory capacity), anti-self-dealing (private enforcement) index (ASD), insider trading rules index, and Disclosure index. List-wise deletions were used to handle missing values for Insider trading rules index. All variables are defined in Tables 1 and 2. ** and * indicate 5% and 10% significance levels, respectively.

	RStaff	RBudget	ASD	PE-DLLS	PE-LLS	Insider T. rules	LE	Disclosure	ITE
RStaff	1								
RBudget	0.3857	1							
ASD	-0.4538	0.5664	1						
PE-DLLS	0.0882	-0.8379*	-0.9154**	1					
PE-LLS	-0.3381	0.2518	0.7953	-0.6384	1				
Insider T. rules	-0.2686	0.0885	0.1808	-0.2182	-0.2873	1			
LE	0.2938	-0.7461	-0.8308	0.8508*	-0.4238	-0.1588	1		
Disclosure	-0.4049	-0.1531	0.5048	-0.3237	0.697	0.2282	0.0534	1	
ITE	-0.3025	0.6607	0.9205**	-0.8737*	0.7655	-0.1351	-0.8963**	0.2159	1

Table 4: Data sources and sample selection process

This table presents the sample selection process in the sample countries with the number of purchases and sales transactions for the total sample period and three sub-periods, as well as the number of companies for the total sample period. We use the first 2 digits of a company's International Securities Identification Number (ISIN) as abbreviations for each country (AT=Austria, BE=Belgium, CH=Switzerland, DE=Germany, FR=France, IT=Italy, NL=the Netherlands). The percentage of purchases vs. the percentage of sales is reported in brackets. *Data is from Directors Deals database, except for Austria (01/2006-12/2007) and Switzerland (2006-02/2007). For these periods data has been collected for these countries from national regulators' directors' dealings web-sides.

	AT	BE	CH	DE	FR	IT	NL	Total
Transaction in Directors Deals database*	**2,822**	**5,207**	**15,631**	**15,658**	**24,962**	**20,826**	**10,296**	**95,402**
Securities other than ordinary (common) and preferred shares	-27	-262	-1,631	-333	-1,215	-1,057	-1,130	-5,655
Deals other than pure purchases or sales	-216	-1,961	-2,520	-2,150	-6,506	-4,226	-5,676	-23,255
Announcement dates before the deal date	-4	-17	-567	-52	-9	-54	-80	-783
Announcement dates later than one month	-52	-136	-17	-299	-1,682	-607	-230	-3,023
Aggregated deals from the same date	-375	-351	-1,850	-2,844	-2,901	-2802	-842	-11,965
Zero net transactions	-14	-13	-22	-79	-66	-66	-8	-268
Missing data on companies' characteristics	-43	-1	-930	-894	-223	-1,247	-943	-4,281
Total sample (2006-2013)	**2,091**	**2,466**	**8,094**	**9,007**	**12,360**	**10,767**	**1,387**	**46,172**
Purchases	1,637	1,480	3,933	6,583	7,524	7,547	810	29,514
Sales	454	986	4,161	2,424	4,836	3,220	577	16,658
Purchases vs. sales	(78;22)	(60;40)	(49;51)	(73;27)	(61;39)	(70;30)	(58;42)	(64;36)
Sub-period 1 (2006-2007)	**739**	**485**	**2,053**	**2,770**	**2,608**	**3,569**	**399**	**12,623**
Purchases	537	213	710	1,713	1,117	2,122	163	6,575
Sales	202	272	1,343	1,057	1,491	1,447	236	6,048
Purchases vs. sales	(73;27)	(44;56)	(35;65)	(62;38)	(43;57)	(59;41)	(41;59)	(52;48)
Sub-period 2 (2008-2010)	**857**	**1,020**	**2,615**	**3,778**	**5,329**	**4,476**	**554**	**18,629**
Purchases	715	724	1,395	3,116	3,765	3,612	375	13,702
Sales	142	296	1,220	662	1,564	864	179	4,927
Purchases vs. sales	(83;17)	(71;29)	(53;47)	(82;18)	(71;29)	(81;19)	(68;32)	(74;26)
Sub-period 3 (2011-2013)	**495**	**961**	**3,426**	**2,459**	**4,423**	**2,722**	**434**	**14,920**
Purchases	385	543	1,828	1,754	2,642	1,813	272	9,237
Sales	110	418	1,598	705	1,781	909	162	5,683
Purchases vs. sales	(78;22)	(57;43)	(53;47)	(71;29)	(60;40)	(67;33)	(63;37)	(62;38)
Number of companies (total sample)	**89**	**127**	**250**	**584**	**613**	**312**	**121**	**2,096**

Table 5: Sample descriptive statistics

This table presents descriptive statistics for the total sample of 46,172 corporate insider transactions in Austria, Belgium, France, Germany, Italy, the Netherlands and Switzerland during the entire sample period (January 2006 to December 2013). For the number of companies, the total for all transactions does not correspond to the sum of sales and purchases since not all companies have only sales or only purchases (rather most (not all) experience sales and purchases).

	Number of companies	Number of disclosures	Volume per disclosure (in €)		Total volume of disclosed transactions (in million €)
			Mean	Median	
Purchase transactions	1,868	29,514	843,963	39,053	24,908.7
Sale transactions	1,663	16,658	2,404,320	128,071	40,051.2
All transactions	2,096	46,172	1,406,911	59,339	64,959.9

Table 6: CARs around disclosure of purchases

Mean cumulative abnormal returns (CARs) and numbers of positive and negative CARs (N) for the total sample and three sub-periods. Reported CARs are for periods of 20 trading days before disclosures (-20 to -1), as well as 2, 5, 10, and 20 days after disclosure. Four different significance tests are used (reported is the corresponding test statistic and the p-value): (i) Cross-section t-test (see, e.g. Brown and Warner (1980); (ii) Standardised Cross-section t-test (see Boehmer et al., 1991); (iii) Corrado Rank test (see Corrado, 1989); (iv) Generalised Sign test (Cowan, 1992).

Panel A: 2006-13										
Event Window	**CAR**	**N (pos:neg)**	**Cross-sec. t-test[(i)]**	**p-value**	**St. cross - sec. t-test[(ii)]**	**p-value**	**Corrado rank test[(iii)]**	**p-value**	**Gen. sign test[(iv)]**	**p-value**
(-20...-1)	-1.77%	12408 : 16845	-20.7568	0.0000	-25.7607	0.0000	-8.9058	0.0000	-42.6170	0.0000
(0...2)	0.49%	15523 : 13730	14.4029	0.0000	11.7940	0.0000	4.6170	0.0000	-6.0215	0.0000
(0...5)	0.79%	15649 : 13604	17.3438	0.0000	13.9654	0.0000	5.3982	0.0000	-4.5412	0.0000
(0...10)	1.05%	15601 : 13652	17.7280	0.0000	15.4312	0.0000	5.2922	0.0000	-5.1052	0.0000
(0...20)	1.55%	15671 : 13582	18.9281	0.0000	16.3908	0.0000	5.6015	0.0000	-4.2828	0.0000
Panel B: 2006-07										
(-20...-1)	-2.89%	2446 : 4018	-18.8264	0.0000	-19.6556	0.0000	-8.7592	0.0000	-25.3583	0.0000
(0...2)	0.33%	3284 : 3180	6.0021	0.0000	6.1920	0.0000	2.8229	0.0048	-4.4590	0.0000
(0...5)	0.42%	3323 : 3141	5.9054	0.0000	6.3299	0.0000	2.8019	0.0051	-3.4863	0.0005
(0...10)	0.50%	3326 : 3138	5.1382	0.0000	6.3737	0.0000	2.7083	0.0068	-3.4115	0.0006
(0...20)	0.00%	3168 : 3296	0.0239	0.9809	1.3186	0.1873	0.7412	0.4586	-7.3519	0.0000
Panel C: 2008-10										
(-20...-1)	-1.46%	6000 : 7615	-10.8308	0.0000	-16.5304	0.0000	-7.1226	0.0000	-21.6013	0.0000
(0...2)	0.54%	7337 : 6278	10.6200	0.0000	6.5331	0.0000	4.2470	0.0000	1.3656	0.1720
(0...5)	0.92%	7373 : 6242	12.6965	0.0000	7.6785	0.0000	5.0665	0.0000	1.9841	0.0472
(0...10)	1.34%	7461 : 6154	14.3580	0.0000	9.5715	0.0000	5.8939	0.0000	3.4957	0.0005
(0...20)	2.31%	7608 : 6007	17.9580	0.0000	13.9634	0.0000	7.6527	0.0000	6.0209	0.0000
Panel D: 2011-13										
(-20...-1)	-1.33%	4019 : 5155	-9.9990	0.0000	-11.6070	0.0000	-6.6404	0.0000	-17.3135	0.0000
(0...2)	0.52%	4984 : 4190	8.4613	0.0000	8.6570	0.0000	5.2480	0.0000	2.8691	0.0041
(0...5)	0.76%	4967 : 4207	10.1874	0.0000	10.6911	0.0000	5.6957	0.0000	2.5135	0.0120
(0...10)	0.84%	4879 : 4295	8.9480	0.0000	9.6534	0.0000	4.3778	0.0000	0.6730	0.5009
(0...20)	1.12%	4833 : 4341	8.8641	0.0000	7.9449	0.0000	4.1978	0.0000	-0.2890	0.7726

Table 7: CARs around disclosure of sales

Mean cumulative abnormal returns (CARs) and the numbers of positive and negative (N) CARs for the total sample and three sub-periods. Reported CARs are for periods of 20 trading days before disclosures (-20 to -1), as well as 2, 5, 10, and 20 days after disclosure. Four different significance tests are used (reported is the corresponding test statistic and the p-value): (i) Cross-section t-test (see, e.g. Brown and Warner (1980); (ii) Standardised Cross-section t-test (see Boehmer et al., 1991); (iii) Corrado Rank test (see Corrado, 1989); (iv) Generalised Sign test (Cowan, 1992).

Panel A: 2006-13										
Event Window	**CAR**	**N (pos:neg)**	**Cross-sec. t-test[(i)]**	**p-value**	**St. cross - sec. t-test[(ii)]**	**p-value**	**Corrado rank test[(iii)]**	**p-value**	**Gen. sign test[(iv)]**	**p-value**
(-20...-1)	1.53%	8837 : 7675	12.6228	0.0000	18.3236	0.0000	6.8898	0.0000	2.3779	0.0174
(0...2)	-0.27%	7513 : 8999	-7.1387	0.0000	-4.5602	0.0000	-2.7375	0.0062	-18.2571	0.0000
(0...5)	-0.57%	7149 : 9363	-10.1065	0.0000	-7.8748	0.0000	-4.6457	0.0000	-23.9302	0.0000
(0...10)	-1.03%	6933 : 9579	-13.6565	0.0000	-11.5199	0.0000	-5.5659	0.0000	-27.2966	0.0000
(0...20)	-1.98%	6737 : 9775	-19.2019	0.0000	-18.3168	0.0000	-7.7804	0.0000	-30.3513	0.0000
Panel B: 2006-07										
(-20...-1)	1.22%	3203 : 2756	6.8443	0.0000	11.5271	0.0000	5.7196	0.0000	2.3991	0.0164
(0...2)	-0.14%	2716 : 3243	-2.5168	0.0118	-1.2085	0.2269	-1.6596	0.0970	-10.2306	0.0000
(0...5)	-0.47%	2587 : 3372	-6.2813	0.0000	-4.7993	0.0000	-3.4345	0.0006	-13.5760	0.0000
(0...10)	-0.93%	2486 : 3473	-8.7706	0.0000	-6.7340	0.0000	-4.5945	0.0000	-16.1953	0.0000
(0...20)	-1.84%	2418 : 3541	-12.4457	0.0000	-9.9691	0.0000	-6.5688	0.0000	-17.9588	0.0000
Panel C: 2008-10										
(-20...-1)	1.96%	2664 : 2235	8.1079	0.0000	8.9141	0.0000	6.4106	0.0000	5.9781	0.0000
(0...2)	-0.28%	2223 : 2676	-3.6269	0.0003	-1.8042	0.0712	-2.2814	0.0225	-6.6233	0.0000
(0...5)	-0.51%	2154 : 2745	-4.4202	0.0000	-2.6117	0.0090	-3.5610	0.0004	-8.5949	0.0000
(0...10)	-0.88%	2117 : 2782	-5.7044	0.0000	-4.1274	0.0000	-3.4207	0.0006	-9.6522	0.0000
(0...20)	-1.76%	2066 : 2833	-8.2784	0.0000	-8.3975	0.0000	-5.5135	0.0000	-11.1094	0.0000
Panel D: 2011-13										
(-20...-1)	1.30%	3043 : 2612	6.4617	0.0000	11.5794	0.0000	6.0679	0.0000	5.0611	0.0000
(0...2)	-0.31%	2560 : 3095	-5.2319	0.0000	-4.8726	0.0000	-2.5641	0.0103	-7.7852	0.0000
(0...5)	-0.63%	2473 : 3182	-6.4987	0.0000	-7.6405	0.0000	-4.2477	0.0000	-10.0991	0.0000
(0...10)	-1.11%	2425 : 3230	-8.6341	0.0000	-9.5135	0.0000	-5.0270	0.0000	-11.3758	0.0000
(0...20)	-2.08%	2364 : 3291	-11.9067	0.0000	-13.2150	0.0000	-7.0057	0.0000	-12.9982	0.0000

Table 8: Multivariate analysis of insider purchase transactions

Results for the total sample (Panel A), and three sub-periods (Panels B, C, and D, respectively). The dependent variable is the cumulative abnormal return for the first 21 trading days after the date of disclosure (including the date of disclosure) ($CAR_{0,20}$). Prior purchase *(PP)* and Prior sale *(PS)* are dummy variables coded one if insiders bought (sold) stocks in their own company during the last 20 trading days prior to the date of disclosure (=day 0). Firm size *(Size)* is the natural logarithm of company's market capitalization on day 0. *Sub2* is a dummy variable coded one for observations during the financial crisis period (2008-10), and zero otherwise. *Insider* is the number of insiders trading on the same day. Transaction volume is expressed as a percentage of the market capitalization on the day of disclosure *(Volume)*. Debt-to-total asset ratio is a proxy for financial risk *(Risk)*. *BM* is the book-to-market ratio. *ITE* is our insider trading enforcement index. Tolerance is a diagnostic test for multicollinearity (1 divided by Variance Inflation Factor *(VIF)*). White (1980) heteroskedasticity adjusted estimates.

Panel A: Total

Independent variables	coefficient	t-value	p-value	tolerance
Sub2	0.5745	3.08	0.002	0.9847
PP	-0.1469	-0.74	0.457	0.9077
PS	-2.1675	-6.4	0.000	0.9083
Insider	-0.0992	-0.92	0.359	0.9949
Volume	-0.0004	-0.07	0.940	0.9982
Risk	0.8272	1.80	0.072	0.9401
Size	-0.2995	-5.95	0.000	0.9567
BM	0.1401	1.19	0.234	0.9899
ITE	-0.2505	-6.05	0.000	0.9463
Constant	5.0250	7.13	0.000	
F-value		15.47	0.000	
R^2 (R^2-adj.)		0.0083 (0.0078)		

Panel B: Sub1

Independent variables	coefficient	t-value	p-value	tolerance
PP	-0.1022	-0.31	0.758	0.8762
PS	-1.0722	-2.00	0.045	0.8646
Insider	-0.1678	-1.65	0.100	0.9901
Volume	0.0041	1.54	0.124	0.9974
Risk	1.9132	2.28	0.023	0.8810
Size	-0.2239	-2.78	0.005	0.8961
BM	0.6644	1.69	0.091	0.9795
ITE	-0.3179	-4.86	0.000	0.9267
Constant	2.9652	2.54	0.011	
F-value		6.2	0.000	
R^2 (R^2-adj.)		0.0126 (0.0106)		

Panel C: Sub2

Independent variables	coefficient	t-value	p-value	tolerance
PP	0.2460	0.76	0.445	0.9160
PS	-2.6942	-4.16	0.000	0.9250
Insider	0.0390	0.18	0.858	0.9925
Volume	0.5175	2.57	0.010	0.9756
Risk	1.3005	1.91	0.056	0.9337
Size	-0.1797	-2.23	0.026	0.9434
BM	2.3783	9.74	0.000	0.9781
ITE	-0.1580	-2.25	0.025	0.9396
Constant	0.7767	0.67	0.502	
F-value		18.67	0.000	
R^2 (R^2-adj.)		0.0281 (0.0272)		

Panel D: Sub3

Independent variables	coefficient	t-value	p-value	tolerance
PP	-0.6514	-1.95	0.051	0.9178
PS	-2.0662	-4.01	0.000	0.9227
Insider	-0.2167	-0.34	0.733	0.9925
Volume	-0.4506	-4.57	0.000	0.9557
Risk	-0.6143	-0.76	0.448	0.9679
Size	-0.3912	-4.42	0.000	0.9467
BM	0.0164	0.62	0.535	0.9582
ITE	-0.3567	-5.37	0.000	0.9544
Constant	8.2356	6.00	0.000	
F-value		11.25	0.000	
R^2 (R^2-adj.)		0.0156 (0.0141)		

Table 9: Multivariate analysis of insider sale transactions

Results for the total sample (Panel A), and three sub-periods (Panels B, C, and D, respectively). The dependent variable is the cumulative abnormal return for the first 21 trading days after the date of disclosure (including the date of disclosure) ($CAR_{0,20}$). Prior purchase *(PP)* and Prior sale *(PS)* are dummy variables coded one if insiders bought (sold) stocks in their own company during the last 20 trading days prior to the date of disclosure (=day 0). Firm size *(Size)* is the natural logarithm of company's market capitalization on day 0. *Sub2* is a dummy variable coded one for observations during the financial crisis period (2008-10), and zero otherwise. *Insider* is the number of insiders trading on the same day. Transaction volume is expressed as a percentage of the market capitalization on the day of disclosure *(Volume)*. Debt-to-total asset ratio is a proxy for financial risk *(Risk)*. *BM* is the book-to-market ratio. *ITE* is our insider trading enforcement index. Tolerance is a diagnostic test for multicollinearity (1 divided by Variance Inflation Factor *(VIF)*). White (1980) heteroskedasticity adjusted estimates.

Panel A: Total

Independent variables	coefficient	t-value	p-value	tolerance
Sub2	-0.9128	-3.35	0.001	0.9890
PP	1.7398	4.13	0.000	0.9015
PS	-0.2469	-1.02	0.306	0.9059
Insider	-0.2066	-1.71	0.086	0.9881
Volume	-0.0122	-1.93	0.054	0.3163
Risk	-0.5782	-1.27	0.205	0.9685
Size	0.2155	2.91	0.004	0.9236
BM	0.0853	5.95	0.000	0.3153
ITE	-0.0089	-0.18	0.855	0.9293
Constant	-3.9748	-3.58	0.000	
F-value		20.52	0.000	
R^2 (R^2-adj.)		0.0082 (0.0073)		

Panel B: Sub1

Independent variables	coefficient	t-value	p-value	tolerance
PP	1.3848	2.44	0.015	0.8907
PS	0.3734	0.99	0.324	0.8951
Insider	-0.4136	-3.07	0.002	0.9860
Volume	-0.0578	-1.65	0.099	0.9674
Risk	0.0554	0.06	0.955	0.8803
Size	0.1664	1.39	0.166	0.9021
BM	1.0846	2.24	0.025	0.9414
ITE	-0.0649	-0.79	0.427	0.9296
Constant	-3.5718	-2.12	0.034	
F-value		3.65	0.000	
R^2 (R^2-adj.)		0.0088 (0.0065)		

Panel C: Sub2

Independent variables	coefficient	t-value	p-value	tolerance
PP	2.1549	2.30	0.021	0.8811
PS	-0.6390	-1.26	0.210	0.8859
Insider	-0.2385	-0.65	0.515	0.9550
Volume	0.2263	1.77	0.077	0.9441
Risk	-1.8700	-1.45	0.148	0.9291
Size	0.2794	1.87	0.061	0.8764
BM	0.6843	1.28	0.201	0.9586
ITE	0.2001	2.07	0.038	0.8880
Constant	-6.0213	-2.71	0.007	
F-value		3.24	0.001	
R^2 (R^2-adj.)		0.0088 (0.0062)		

Panel D: Sub3

Independent variables	coefficient	t-value	p-value	tolerance
PP	1.6288	2.8	0.005	0.9216
PS	-0.3667	-0.96	0.339	0.9200
Insider	0.8439	2.87	0.004	0.9941
Volume	-0.0122	-1.91	0.056	0.3039
Risk	-0.4905	-0.88	0.376	0.9839
Size	0.2876	2.32	0.020	0.8422
BM	0.0875	5.83	0.000	0.2986
ITE	-0.1286	-1.68	0.092	0.9024
Constant	-6.1545	-3.11	0.002	
F-value		18.00	0.000	
R^2 (R^2-adj.)		0.0187 (0.0163)		

Figure 1: Insider transactions during sample period

This figure provides the number of monthly insider purchase and sale transactions for our total sample comprising all deals disclosed in Austria, Belgium, France, Germany, Italy, the Netherlands and Switzerland for each month during the entire sample period (January 2006 to December 2013).

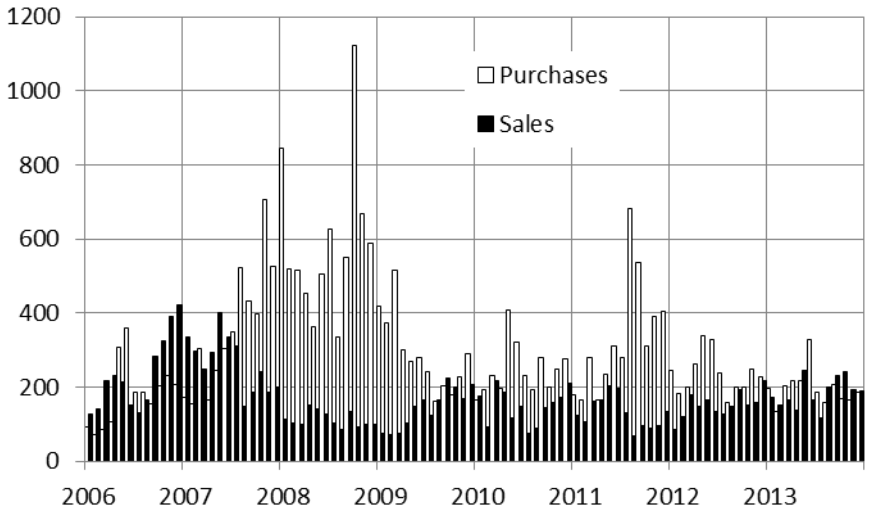


Figure 2: CARs around the disclosure date

This figure shows mean Cumulative Abnormal Returns (CARs) for the total sample of 29,514 insider purchase and 16,658 insider sale transactions. CARs are computed in cumulating abnormal returns of the last 20 trading days prior to the disclosure date (T_{-20} to T_{-1}), the abnormal return on the disclosure date (T_0), and the abnormal returns in the first 20 trading days after the disclosure date (T_1 to T_{20}).

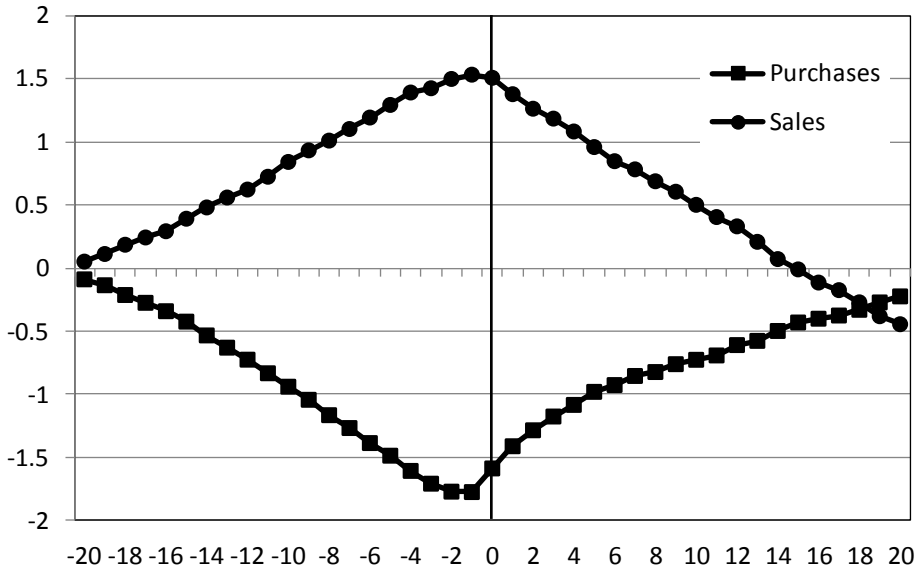
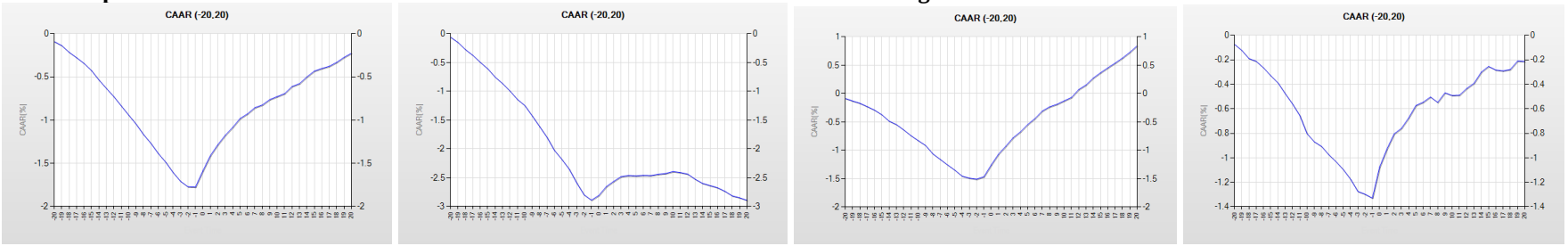


Figure 3: CARs in three sub-periods

In Panel A we present CARs (CAAR: Cumulative average abnormal returns) around the disclosure date of purchase transactions for the total sample (2006-13), in the pre-crisis period (2006-07), during the crisis (2008-10), and after the crisis (2011-13). Panel B exhibits CARs around the disclosure date of sale transactions for the total sample (2006-13), in the pre-crisis period (2006-07), during the crisis (2008-10), and after the crisis (2011-13).

Panel A: Purchases

Total sample **Before crisis** **During crisis** **After crisis**



Panel B: Sales

Total sample **Before crisis** **During crisis** **After crisis**